

DAMOP05-2005-020036

Abstract for an Invited Paper
for the DAMOP05 Meeting of
the American Physical Society

New Opportunities in Plasma Production of Radicals and Ions for Treatment of Surfaces

MARK J. KUSHNER, Iowa State University

The plasma production of radicals and ions for treatment of surfaces spans a large range in value of the material. In microelectronics, plasma production of radicals and ions modifies materials having values of \$100s - \$1000s/cm². At the other extreme, plasmas are used to modify polymers having values of \$0.05/m². In recognition of these differences in market value, the technologies used for modification of surfaces are also different. Microelectronics fabrication is performed almost exclusively by low pressure plasmas using complex tailored gas mixtures (e.g., Ar/C₄F₈/O₂/N₂/CO for etching of dielectrics). Polymer modification is typically performed using atmospheric pressure plasmas sustained in (humid) air. As new applications of plasma modification (or fabrication) of surfaces are considered, such as for biocompatibility, there are also new opportunities for developing or adapting technologies that optimally produce the desired radicals and ion fluxes required for surface modification. These decisions are best made with knowledge of the manner in which the plasma generated species interact with the surface. For example, the hydrophilic nature of polymer surfaces depends not only on the increase in surface energy imparted by reaction with plasma generated species but also on the change in morphology which also occurs. In this talk, the development of new plasma technologies for surface treatment will be discussed from the perspective of opportunities for contributions from the AMO community in both gas phase generation of reactive species and their interaction with surfaces.